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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/CN98/00283 <b>(22) International Filing Date:</b> 1 December 1998 (01.12.98) <b>(71)(72) Applicant and Inventor:</b> BI, Fujun [CN/CN]; 8/F Harmony Tower, 138 Wangfujing Street, Beijing 100006 (CN). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> XU, Xingguo [CN/CN]; 7/F Harmony Tower, 138 Wangfujing Street, Beijing 100006 (CN). YAN, Hong [CN/US]; 268 East Ridge Drive, San Ramon, CA 94583 (US). WANG, Yong [CN/US]; 168 Wilson Street, Berkeley, CA 94710 (US). LAM, Fong, Shing [CN/US]; 1402 Greekside Dr. #6, Walnut Creek, CA 94596 (US). SAW, Sengkeng, Daniel [MA/US]; 12657 Alcosta Blvd. #418, San Ramon, CA 94583 (US). ZHOU, Gengqiang, Gary [CN/US]; 12657 Alcosta Blvd #418, San Ramon, CA 94583 (US). <b>(74) Agent:</b> LIU, SHEN & ASSOCIATES; A0601, Huibin Building, Chaoyang District, No.8 Beichen Dong Street, Beijing 100101 (CN).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DE (Utility model), DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> A MULTI-FACTOR STOCK SELECTION SYSTEM AND THE METHOD THEREFOR		
<pre>graph LR     subgraph UI [User Interface(s)]         IM[Input means]         OM[Output means]     end     IM --&gt; SM[Selection means]     SM --&gt; PP[preprocessor]     PP &lt;--&gt; FDS[Factor Data storage]     PP &lt;--&gt; DB[(DB)]     DB --&gt; SDRM[Stock data receiving means]</pre>		
<b>(57) Abstract</b> <p>A stock selection system and the method therefor are disclosed, said system comprising: at least one computer system; stock data receiving means for receiving raw stock data from external stock information sources; a database for storing said raw stock data; stock data pre-processing means for processing the stock data from said database to obtain factor data; factor storage means for storing the processed factor data; input means for presenting a user a plurality of financial indicators and receiving search criteria set by the user for each of said financial indicators; selection means for searching stocks which meet the plurality of search criteria using the factor data stored in the factor storage means according to a predetermined algorithm, and selecting the stocks as recommended stocks; output means for presenting the selected stocks to the user. This stock selection system overcomes the long-time outstanding difficulty in handling the mass amount stock information, and extracts valuable information from the raw stock data efficiently to help the traders to select their preferred stocks according to their multiple selection criteria.</p>		

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## **A multi-factor stock selection system and the method therefor**

### **Field of the invention**

5 The present invention relates to an electronic financial tool used for stock market, specifically, an internet-based stock selection system and a stock selection method, integrating both fundamental and technical analysis techniques for individual and institutional stock traders to select their preferred stocks.

10

### **Technical background**

Stock market is always concerned by the individual and institutional share holders. As more and more people are involved in the stock market in China, there is growing demand for stock selection tool to help the investors to  
15 extract the best stocks from the mass amount of stock data, based on the investor's consideration on different aspects of the data of a specified stock.

In the conventional stock trading systems, there are few sophisticated tools  
20 to help the investors to select stocks based on their own consideration on various aspects. Fig. 1 is an illustrative diagram of a conventional stock selection technology used on the internet provided by, for example, Microsoft Investor and DJL Stock Watcher. As shown in Fig. 1, a user can generate one or two search criteria, and the stocks selected by this  
25 technology are ranked based on one and only one individual criteria.

Obviously, this technology has the following defects: selection criteria are limited; performance of a stock selected cannot be reflected in a multi-facet manner; and consequently, the stocks selected tend to be less satisfied.

5    **Object of the invention**

The object of this invention is to provide a flexible, easy-to-use, web-based stock selection system and the method therefor to facilitate the stock selection process for individual and institutional stock traders. This stock selection system, which is also called “New Eight-factor Stock Selector  
10    (NEFSS)” , can recommend the best stocks that meet the trader’ s multiple selection criteria; integrate the best analysis techniques and modules that practically and theoretically proved valid and effective; provide a friendly user interface for the trader; help the trader to manage his investment portfolio in the long run.

15

**Summary of the invention**

The present invention provides a stock selection system, comprising: at least one computer system; stock data receiving means for receiving raw stock data from external stock information sources; a database for storing said raw  
20    stock data; stock data pre-processing means for processing the stock data from said database to obtain factor data; factor storage means for storing the processed factor data; input means for presenting a user a plurality of financial indicators and receiving search criteria set by the user for each of said financial indicators; selection means for searching stocks which meet  
25    the plurality of search criteria using the factor data stored in the factor storage means according to a predetermined algorithm, and selecting the

stocks as recommended stocks; output means for presenting the selected stocks to the user.

The present further provides a computerized stock selection method ,  
5 comprising the steps of: receiving raw stock data from external stock  
information sources; pre-processing the raw stock data to obtain factor data;  
presenting a user a plurality of financial indicators and receiving search  
criteria set by the user for each of said financial indicators; searching stocks  
which meet the plurality of search criteria using said factor data according  
10 to a predetermined algorithm, and selecting the stocks as recommended  
stocks; presenting the selected stocks to the user.

#### **Brief description of the drawings**

Fig. 1 shows an illustrative diagram of a conventional stock selection  
15 technology used on the internet;

Fig. 2 illustrates the architecture diagram of the stock selection system  
according to the present invention;

Fig. 3 illustrates main process according to the stock selection method  
according to the present invention;

20 Fig. 4 illustrates the selection process according to an embodiment of the  
stock selection method according to the present invention;

Fig. 5 illustrates the logic and relationships among these models in one  
embodiment of this invention;

Fig. 6 shows the architecture diagram of an embodiment of the stock  
25 selection system;

Fig. 7 shows the process executed in the preprocessor in the stock selection  
system;

Fig. 8A shows a sample user interface provided on the basis of the internet for the user to input the search criteria;

Fig. 8B shows an interface for presenting the user with the selected stocks in a ranked manner;

5 Fig. 9 illustrates the main data flow diagram of the stock selection operation in an embodiment of the stock selection system of the present invention;

### **Detailed description of the preferred embodiments**

The preferred embodiments of the present invention will be described below  
10 with reference to the drawings.

Fig.2 shows the illustrative diagram of the stock selection system according to an embodiment of the present invention. As shown in Fig. 2, the stock selection system comprises: stock data receiving means for receiving raw  
15 stock data from external stock information sources; a database for storing said raw stock data; stock data pre-processing means for processing the stock data from said database to obtain processed factor data; factor data storage means for storing the processed factor data; input means for presenting a user a plurality of financial indicators and receiving search  
20 criteria set by the user for each of said financial indicators; selection means for searching stocks which meet the plurality of search criteria based on the processed data in the fast storage means according to a predetermined algorithm and selecting the stocks as recommended stocks; output means for presenting the selected stocks to the user.

25

The selection means may be a stock selection server integrating different financial models(will be described later) for selecting stocks. The input

means and output means may be user interfaces provided to the clients on the basis of web browsers.

Fig.3 illustrates main process according to the stock selection method according to the present invention. As shown in Fig.3, the raw stock data are received from external stock information sources; the raw stock data are preprocessed to obtain common used financial factors, such as the factors listed in Table 1; presenting a user a plurality of financial indicators and receiving search criteria set by the user for each of said financial indicators; searching stocks which meet the plurality of search criteria based on the factor data in the factor data storage means according to a predetermined algorithm and selecting the stocks as recommended stocks; and presenting the selected stocks to the user. As shown in Fig. 3, after conducting a selection, the user can return to the criteria setting step to set other criteria and conduct another selection.

The idea of this invention is to integrate the different models in both fundamental and technical analysis techniques. To achieve this, the raw stock data such as daily quote data, company information, published yearly report, etc. are collected and stored in a central database, and the factors used in the various analysis models are extracted or calculated in advance from the above collected raw stock data, including factors about company basics, valuation ratio, profitability ratio, growth rates, dividends, financial strength, market price, and trading volume, and stored in a fast factor storage means, which can be a file storage in the central database, or an Object Oriented database. When conducting search for the recommended stocks, these factor



data can be used directly, therefore the process for selecting stocks is accelerated.

Table 1 shows the factors to be prepared for each of the stocks in the preprocessing process in one embodiment of the multi-factor stock selection system according to the present invention.

Table 1 Factors used in the system

Item	Factor	Factor in Chinese	Physical Name
	<b>Company Basics</b>	公司背景	<b>ef_company</b>
1	%Institutional Ownership	法人股	c_institution
2	Insider Ownership	内部职工股	c_insider
3	EPS: 12 month	年报每股收益	c_eps12
4	EPS: 6 month	中报每股收益	c_eps6
5	Market Value(¥ millions)	股票市值	c_mkt_value
6	Revenue: 12 month	年报总收益	c_revenue12
7	Revenue: 6 month	中报总收益	c_revenue6
8	Current Assets	流动资产	c_current ass
9	Total Assets	总资产	c_total ass
10	Current Liabilities	流动负债	c_current lib
11	Float	流通股	c_float
12	Share Outstanding	总股本	c_share
	<b>Valuation Ratio</b>	价值比率	<b>ef_valuation</b>
13	P/E Ratio:6-month	市盈率(12月)	v_pe6
14	Price/Revenue	价格/收入比率	v_price rev
15	Revenue/Share	每股营业收入	v_rev_share
	<b>Profitability Ratio</b>	收益比率	<b>ef_profit</b>
16	ROE(%)	净资产收益率	p_roe
17	ROA(Return on Assets)	总资产收益率	p_roa
18	ROE: 3-year Average	三年净资产收益率平均值	p_roe_3yr
19	ROA: 3-year Average	三年总资产收益率平均值	p_roa_3yr
20	Net Profit Margin	主营业务利润率	p_net margin
21	Net Profit: 6 month	中报净利润	p_net 6m

47	Price percentage change – 10 day	10天价格变化	
48	Price percentage change – 30 day	30天价格变化	
49	Price percentage change – 60 day	60天价格变化	
50	Price percentage change – 120 day	120天价格变化	
51	Price percentage change- 250 day	250天价格变化	
52	Moving average 250-day	250 天移动平均价位	
	<b>Trading Volume</b>	<b>交易数量</b>	<b>ef volume</b>
53	Previous Days' Volume	昨日交易量	t_prev_day
54	Average Daily Volume: Last two weeks	10天平均交易量	t_avrg_2w
55	Average Daily Volume: Last 6 months	120天平均交易量	t_avrg_6m
56	Average Daily Volume: Last month	20天平均交易量	t_avrg_1m
57	Average Daily Volume: Last week	5天平均交易量	r_avrg_1w
58	Average Daily Volume: 250天	250天平均交易量	
59	Average Daily Volume: 60天	60天平均交易量	
60	Average Daily Volume: 30天	30天平均交易量	

Since the stock selection system is developed in both English and Chinese, the factor names in both English and Chinese are listed in the Table 1. Of course, this system can be implemented in any other language. And the factors listed here can be changed, added, or deleted if necessary.

Fig.4 illustrates the selection process according to an embodiment of the stock selection method according to the present invention. As shown in Fig.4, on a user interface(will be illustrated below), the user determines the

22	Net Profit: 1 year	年报净利润	p_net_1yr
23	Accounts Receivable Turnover	应收帐款周转率	p_ar_turnover
24	Earning Power Ratio	资产利润率	p_earning_pwr
	<b>Growth Rates</b>	增长比率	ef_growth
25	6-Month Revenue Growth Rate(%)	主营业务收入增长率(中报同期比较)	g_rev_6m
26	6-month Earning Growth Rate(%)	净利润增长率(中报同期比较)	g_earning_6m
27	1-Yr Revenue Growth Rate(%)	主营业务增长率(年报同期比较)	g_rev_1yr
28	1-Yr Earning Growth Rate(%)	净利润增长率(年报同期比较)	g_earning_1yr
29	3-Yr Comp Avg Revenue Growth Rate(%)	三年主营业务收入平均增长率	g_rev_3yr
30	3-Yr Comp. Avg Earning Growth Rate	三年净利润平均增长率	g_div_3yr
	<b>Dividends</b>	分红情况	ef_dividend
31	Latest Dividend Rate	每股红利	d_div_rate
33	Payout: Latest Fiscal year	分红利润比率	d_payout
	<b>Financial Strength</b>	财务指标	ef_fin_strength
34	D/E Ratio	负债比率	f_d_e
35	Current Ratio	流动资产/负债比率	f_current
36	Quick Ratio	速动比率	f_quick
37	Leverage Ratio	长期负债/净资产比	f_leverage
	<b>Market Price</b>	价格参数	ef_mkt_price
38	Previous Day's closing price	昨日收盘价	m_prev_close
39	Price high(52 week)	250天最高收盘价	m_high_52w
40	Price Low(52 week)	250天最低收盘价	m_low_52W
41	Price change 1 week	5天价格变化	m_change_1w
42	Price-4 week percent change	20天价格变化	m_change_4w
43	Moving average 50-Day	50天移动平均价位	m_mavrg_50d
44	Moving average last week	5天移动平均价位	m_avrg_1w
45	3-Year High	3年最高价位	m_high_3yr
46	3-Year Low	3年最低价位	m_low_3yr

selection scope, such as exchange and industry, chooses multi-criteria for the above financial indicators, and customize the preference and value range for each of the criteria; then the system performs the search and rank stocks based on the multi-criteria set by the user, finally, the selected stocks are presented with details to the user.

In one embodiment of the present invention, the following commonly used stock market analysis tools are used:

1. Moving Average Techniques
- 10 2. Ratio Analysis Techniques
3. Gantt' s Trading theory
4. Oscillator Theory
5. Random Index Theory
6. Relative Strength Theory
- 15 7. Comprehensive Dow' s Index Analysis
8. Elliott' s Wave Theory

The Elliott' s wave theory serves as the main model in the embodiment of the stock selection system according to the present invention.

20 The logic and relationships among these models in one embodiment of this invention are shown in Fig. 5. The user will choose the primary stock selection model out of the above eight models, the outcome of the first model serves as the full set of candidate stocks subject to further evaluation. Other seven models are triggered. For each model, a normalized value is given as outcome, i.e., N1, N2, N3, N4, N5, N6, N7 and N8. Respective data  
25 are retrieved from the factor database for each model. Then the outcomes of all eight models are re-evaluated with normalization, the re-normalized

individual model outcome data are summed as single indicator  $N$ ,  $N=N_1+N_2+N_3+N_4+N_5+N_6+N_7+N_8$ , and the stock with the maximum  $N$  is recommended first. The algorithm for generating the Normalized value for the models will be described below.

5

For the factors set by the user, the normalized values thereof are calculated according to the criteria (preference, selected Maximum, Minimum) set for a certain factor by the user, respectively. If the Value of this factor is none, this calculation is not performed.

10

For example, the exchange is "Shenzhen", and the industry is "Harbour", and the stock codes are 0088, 0999,..... Here only use 0088 as an example.

15 Table 2 shows the user's setting for factor of 16, 27 and 28.

Factor name	( factor_id )	Preference	Selected Maximum	Selected minimum
Price/Revenue	16	Low	1498.1011	615.5058
6-Month Revenue Growth Rate(%)	27	Intermediate	459.5	-1.0
6-month Earning Growth Rate(%)	28	High	-1.2	-1.2772406

The Max,Min,Value in the formula are all values in the database.

20 Factor 16:

Max=35.663349 Min=0.056723 Value=0.4499490000000000

From table 2:

selectMax=1498.1011 selectMin=615.5058 bestSelection=2(low)

therefore:

1. calculating normMax, normMin, normValue

$$\begin{aligned} 5 \quad \text{normMax} &= (\text{selectMax} - \text{Min}) / (\text{Max} - \text{Min}) \\ &= (1498.1011 - 0.056723) / (35.663349 - 0.056723) \\ &= 42.0720676 \end{aligned}$$

$$\begin{aligned} \text{normMin} &= (\text{selectMin} - \text{Min}) / (\text{Max} - \text{Min}) \\ &= (615.5058 - 0.056723) / (35.663349 - 0.056723) \\ 10 \quad &= 17.28467833 \end{aligned}$$

$$\begin{aligned} \text{normValue} &= (\text{Value} - \text{Min}) / (\text{Max} - \text{Min}) \\ &= (0.449949 - 0.056723) / (35.663349 - 0.056723) \\ &= 0.0110436187 \end{aligned}$$

- 15 2. judging if normValue is between normMax and normMin , based on the different condition, calculating the factor value(retval)

the result is:

since normValue < normMin

$$\begin{aligned} 20 \quad \text{retval} &= \text{normValue} - \text{normMin} \\ &= 0.0110436187 - 17.28467833 \\ &= -17.273634711 \end{aligned}$$

factor 27

$$25 \quad \text{Max}=459.5 \quad \text{Min}= -1.0 \quad \text{Value}= -0.2655150000000000$$

From Table 2:

selectMax=459.5 selectMin= -1.0 bestSelection=1(intermediate)

hence:

1. calculating normMax, normMin, normValue

$$\text{normMax} = (\text{selectMax} - \text{Min}) / (\text{Max} - \text{Min})$$

$$= (459.5 - (-1.0)) / (459.5 - (-1.0))$$

$$5 \quad = 1$$

$$\text{normMin} = (\text{selectMax} - \text{Min}) / (\text{Max} - \text{Min})$$

$$= (-1.0 - (1.0)) / (459.5 - (-1.0))$$

$$= 0$$

$$\text{normValue} = (\text{Value} - \text{Min}) / (\text{Max} - \text{Min})$$

$$10 \quad = (-0.265515 - (-1.0)) / (459.5 - (-1.0))$$

$$= 0.0110436187$$

2. judging if normValue is between normMax and normMin, based on the different conditions, calculating the factor value(retval)

15 the result is:

$$\text{normMin} < \text{normValue} < \text{normMax}$$

therefore

since bestSelection=1(intermediate)

$$\text{retval} = |\text{normValue} - \text{normMin} + (\text{normMax} - \text{normMin}) / 2|$$

$$20 \quad = |0.0110436187 - 0 + (1 - 0) / 2|$$

$$= 0.5110436187$$

(if bestSelection = 2(low)

$$\text{retval} = \text{normMax} - \text{normValue}$$

if bestSelection is other values(high)

$$25 \quad \text{retval} = \text{normValue} - \text{normMin}$$

factor 28:

Max= -0.393617 Min= -1.733945 Value= -0.9518070000000000

From Table 2:

selectMax=-1.2 selectMin= -1.2772406

bestSelection=3(high) (can be any number except 1 and 2)

5 hence:

1. calculating normMax, normMin, normValue

normMax= (selectMax - Min)/(Max-Min)

$=(-1.2 - (-1.733945)) / (-0.393617 - (-1.733945))$

$=0.39836$

10 normMin= (selectMin- Min)/(Max-Min)

$=(-1.2772406 - (-1.733945)) / (-0.393617 - (-1.733945))$

$=0.34074077$

normValue=(Value -Min)/(Max-Min)

$=(-0.951807 - (-1.733945)) / (-0.393617 - (-1.733945))$

15  $=0.5835422$

2. judging if normValue is between normMax and normMin , based on different conditions, calculating the factor value(retval)

20 the result is:

$\text{normMax} < \text{normValue}$

therefore

$\text{retval} = \text{normMax} - \text{normValue}$

$=0.39836 - 0.5835422$

25  $= -0.1851822$

summing the above factor values:



$$\begin{aligned}\text{sum} &= -17.273634711 + 0.5110436187 - 0.1851822 \\ &= -16.9477329\end{aligned}$$

Accordingly, the N value for stock 0088 is -16.9477329.

5

The N values of the other stocks are calculated in the same manner, and all the stocks are ranked in descending order of their respective N values .

The above algorithm is only for exemplary purpose, the present invention is not limited to this algorithm. A person skilled in the art can use other algorithm based on the principle and spirit of the present invention.

Fig. 6 shows the architecture diagram of an embodiment of the stock selection system. As shown in Fig. 6, the stock selection system includes a central database for storing various financial data; a continuous loader, such as a receiver capturing data from broadcast or satellite, for loading quote data from the stock market; a data administration tool for operator to enter or edit individual company report or information; data batch loader for interpreting published yearly reports, such as extracting relevant financial parameters from company financial statements, organise and insert into the central database; a stock selector data preprocessor for pre processing data each day against market data and company financial data available in the central data base and file storage system, and storing the result into the data base for future retrieval; the stock selector server module collects user criteria, selects and ranks securities with the eight factor model algorithm, and outputs retrieval list to the user with hyperlinks to detailed security information such as charts and financial reports. The raw stock received

from the continuous loader, admin tool and data batch loader are stored in the main database.

This stock selection system accesses to the internet by means of a web server, so as to present programmed Graphic User Interface(GUI) provided on the client terminals based on browser technology, to receive the user's preference and value range criteria set for the financial indicators. After the stock selector server selects the stocks which meets the criteria set by the user based on the factor data in the file storage, the system presents the selected ranked stocks on the screen of the user terminal with another GUI.

In this stock selection system, the stock selection server integrating the financial models includes a Java Server that serves the NEFSS request. The Java server performs all major computation of NEFSS according to the financial models. In the first implementation, it selects and ranks securities according to user selected financial criteria.

The NEFSS JAVA Server talks to the web server through Java Servlet technology, which also manages threads. The Java Server loads security data from the central database, for example, Informix, through JDBC(Java Database Connection), stores the data in the memory space. Each client request then accesses the memory space and performs retrieval and calculation on it.

Servlets are modules that run inside request/response-oriented servers, such as Java-enabled web servers, like Netscape Enterprise server 3.5.1 and up, and extend them in some manner. For example, a servlet may be responsible

for taking data in a HTML order-entry form and applying the business logic used to update a company's order database.

Servlets are an effective substitute for CGI(Common gateway interface) scripts: they provide a way to generate dynamic documents that is both easier to write and faster to run. They also address the problem of doing server-side programming with platform-specific APIs(Application interfaces). Servlets are developed with the Java Servlet API, a standard Java extension.

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The Servlet module sends user request to the Java server, creates a multi-factor object for the user request, it then obtains a network connection from the socket pool. If not available, it creates one. The factors object with the user specified criteria is sent to the Java server, the Servlet waits on a response.

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The Java server performs the task of selecting stocks based on stock exchange and industry group selection. It uses Basic select model to further limit and rank the stocked selected. The main modules of the Java Server are the JavaServer package and the JavaServer Communication package. The JavaServer packages starts up a server process that listens to a specified port, when a multi-factor request is sent to the server. The initialized phase of the Jave server loads an JDBC driver, obtains a JDBC connection and loads the stock and parameter data into the criteria hash table.

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Fig. 7 shows the process executed in the preprocessor in the stock selection system. As shown in Fig. 7, the quote data and company financial report data are utilized to calculate the factors as listed in Table 1 for each of the stocks according to common known algorithm. The factor data are stored in a file storage in the central database for fast retrieval. The factor data can also be an object-oriented database.

By presenting user a friendly interface/form as mentioned above, the trader can select from many financial indicators(factors) and then set criteria for the selected indicators. Once the criteria is set, the system selects and ranks the securities according to the criteria chosen and present the retrieved securities. Besides the financial indicators, the system allows users to limit the domain of search to a subset of all securities with specifications on stock exchange and industry groups.

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Fig. 8A shows a sample user interface(in Chinese) provided on the basis of the internet for the user to input the search criteria. According to the user's selection: the exchange is Shenzhen, the industry is Utilities. The financial indicator displayed in Fig. 8A is 3 indicators of the type of trading volume, specifically, previous days' volume, average daily volume-last 120 days, and average daily volume-last 10 days. The user can select his preferred parameters related to the indicators: for example, the previous Days' volume is high, the average daily volume-last 120 days is intermediate; the average daily volume-last 10 days is low. Also, the user can set the value range for each of the indicators(factors). Factors of different types can be set by the user in the same interface.

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The user can also set the search criteria for the other seven financial indicators with other similar interfaces. Or alternatively, all the multiple indicators can be set in one user interface.

5 Fig. 9 illustrates the main data flow diagram of the stock selection operation in an embodiment of the stock selection system of the present invention. As shown in Fig. 9, the user selects the scope of exchange and industry, then selects criteria group and value range for each of the multiple financial indicators with the above interface(s). The system uses the factor data stored  
10 in the factor data storage to calculate the factor values for each of the stocks in the selected scope, then normalize the respective factor values; and the related stocks are ranked according to their normalized values as described before, and listed as selected stocks to the user on a user interface.

15 Fig. 8B shows an interface for presenting the user with the selected stocks list in a ranked manner.

Below is an concrete example of Shanghai Exchange, Automobile Industry for the selection procedure:

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criteria I is:

P/E ratio:

Preference? Low

Value range? 1-50

25 Criteria II is profit/share(1 year)

Preference? High

Value range? 100,000-100,000,000RMB

Assume there are 4 stocks have value within the data range, and the normalized P/E ratio are 50, 1, 40, 100 and Profit/share are 1, 100, 49, 22. They are normalized and summed as shown in table 3.

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Table 3 N values list

stock	Normalized P/E ratio	Normalized profit/share	Summation
Stock A	.5	0.1	0.6
Stock B	1	0.6	1.6
Stock C	0.4	0.49	0.89
Stock D	0	0.6	0.6

The rank of this stock list will be:

1. Stock B; 2. Stock C; 3. Stock A; 4. Stock D

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### **Industrial applicability**

In summary, the present invention provides an electronic financial tool used for stock market, and meets the demands for a sophisticated stock selection system integrating both fundamental and technical analysis techniques of different models for the individual and institutional stock traders. This stock selection system overcomes the long-time outstanding difficulty in handling the mass amount stock information, and extracts valuable information from the raw stock data efficiently to help the traders to select their preferred stocks according to their multiple selection criteria. Furthermore, this system can be integrated with online-trading tools, and become a very high efficiency trading tool.

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Having described and illustrated the principles of the invention in preferred embodiments thereof, it should be apparent that the invention can be modified in arrangement and detail without departing from such principles. All modifications and variations coming within the spirit and scope of the  
5 invention are covered by the appended claims.

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What is claimed is:

1. A stock selection system, comprising:  
at least one computer system;  
5 stock data receiving means for receiving raw stock data from external stock information sources;  
a database for storing said raw stock data;  
stock data pre-processing means for processing the stock data from said database to obtain factor data;  
10 factor storage means for storing the processed factor data;  
input means for presenting a user a plurality of financial indicators and receiving search criteria set by the user for each of said financial indicators;  
selection means for searching stocks which meet the plurality of search criteria using the factor data stored in the factor storage means according to  
15 a predetermined algorithm, and selecting the stocks as recommended stocks;  
output means for presenting the selected stocks to the user.
2. The stock selection system according to Claim 1, wherein said input means and output means are programmed Graphic User Interfaces(GUI)  
20 provided to users.
3. The stock selection system according to Claim 2, wherein said GUIs are provided to the users via internet by means of browser technology.
- 25 4. The stock selection system according to Claim 3, wherein said factor storage means is a file storage exists along with said database for fast retrieval.



5. The stock selection system according to Claim 3, wherein said factor storage means is an Object Oriented database.

5 6. The stock selection system according to Claim 4 or 5, wherein said input GUI provides options for exchange and industry, and presents customized preferences and value ranges to be set for each of the financial indicators.

7. The stock selection system according to Claim 6, wherein said output GUI  
10 presents ranked stock list to the user.

8. The stock selection system according to Claim 7, wherein said raw stock data receiving means includes a continuous loader for receiving daily quote data from the stock market; a data administrator for operators to enter or edit  
15 individual company information; a data batch loader for interpreting published yearly reports and extracting financial parameters from company information.

9. The stock selection system according to Claim 8, wherein said stock data  
20 preprocessing means calculates common used financial factors from the raw stock data including daily quote data, company information, and published yearly report, and stores the factor data into the factor tables in the factor storage means.

25 10. The stock selection system according to Claim 9, wherein said financial indicators include factors of company data, valuation ratio, profitability ratio,

growth rates, dividends, financial strength, market price, and trading volume.

11. The stock selection system according to Claim 10, wherein said selecting  
5 means includes a stock selection server integrating different financial models to calculate normalized values for each of the indicators set by the user, and rank the selected stocks according to the respective normalized values.

12. A computerized stock selection method , comprising the steps of:  
10 receiving raw stock data from external stock information sources;  
pre-processing the raw stock data to obtain factor data;  
presenting a user a plurality of financial indicators and receiving search criteria set by the user for each of said financial indicators;  
searching stocks which meet the plurality of search criteria using said  
15 factor data according to a predetermined algorithm, and selecting the stocks as recommended stocks;  
presenting the selected stocks to the user.

13. The stock selection method according to Claim 12, wherein said steps of  
20 setting the search criteria and presenting the selected stocks are implemented by programmed Graphic User Interfaces(GUI) provided to users.

14. The stock selection method according to Claim 13, wherein said GUIs  
are provided to the users via internet by means of browser technology.

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15. The stock selection method according to Claim 14, wherein said received raw stock data is stored in a database.

16. The stock selection method according to Claim 15, wherein said stock data pre-processing step calculates common used financial factors from the raw stock data, and stores the factor data into the factor tables in a file storage exists along with said database for fast retrieval or an Object Oriented database.

17. The stock selection method according to Claim 16, wherein said input GUI provides options for exchange and industry, and presents customized preferences and value ranges to be set for each of the financial indicators.

18. The stock selection method according to Claim 17, wherein said output GUI presents ranked stock list to the user.

19. The stock selection method according to Claim 18, wherein said raw stock data includes daily quote data transmitted from the stock market; collected individual company information; published yearly reports and parameters extracted from company information.

20. The stock selection method according to Claim 19, wherein said financial indicators include factors of company data, valuation ratio, profitability ratio, growth rates, dividends, financial strength, market price, and trading volume.

21. The stock selection method according to Claim 20, wherein said selecting step calculates normalized values for each of the indicators set by

the user with different financial models, and ranks the selected stocks according to the respective normalized values.

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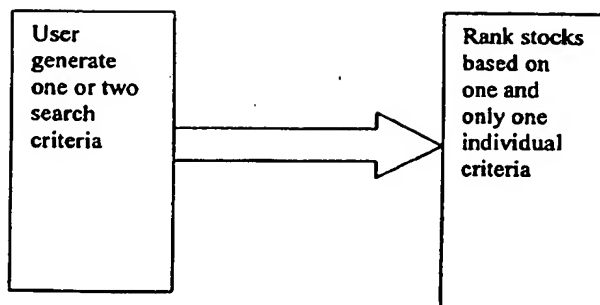


Fig. 1

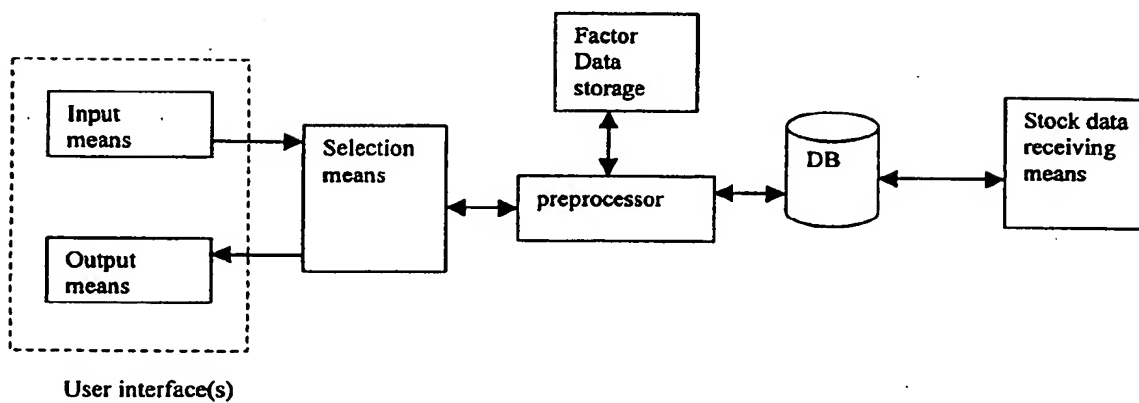


Fig. 2

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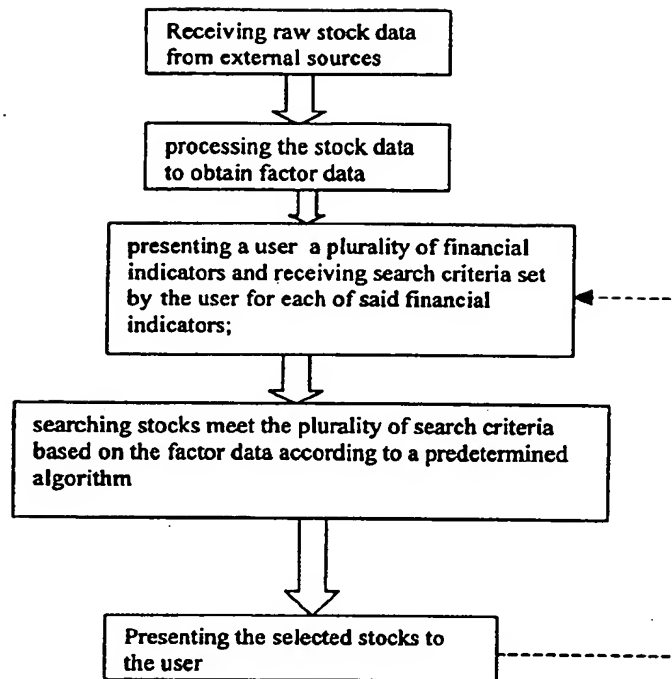


Fig. 3

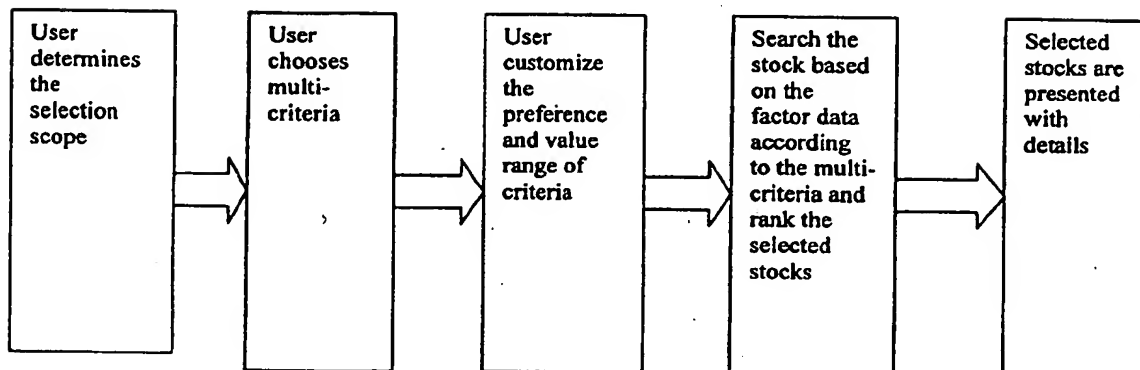
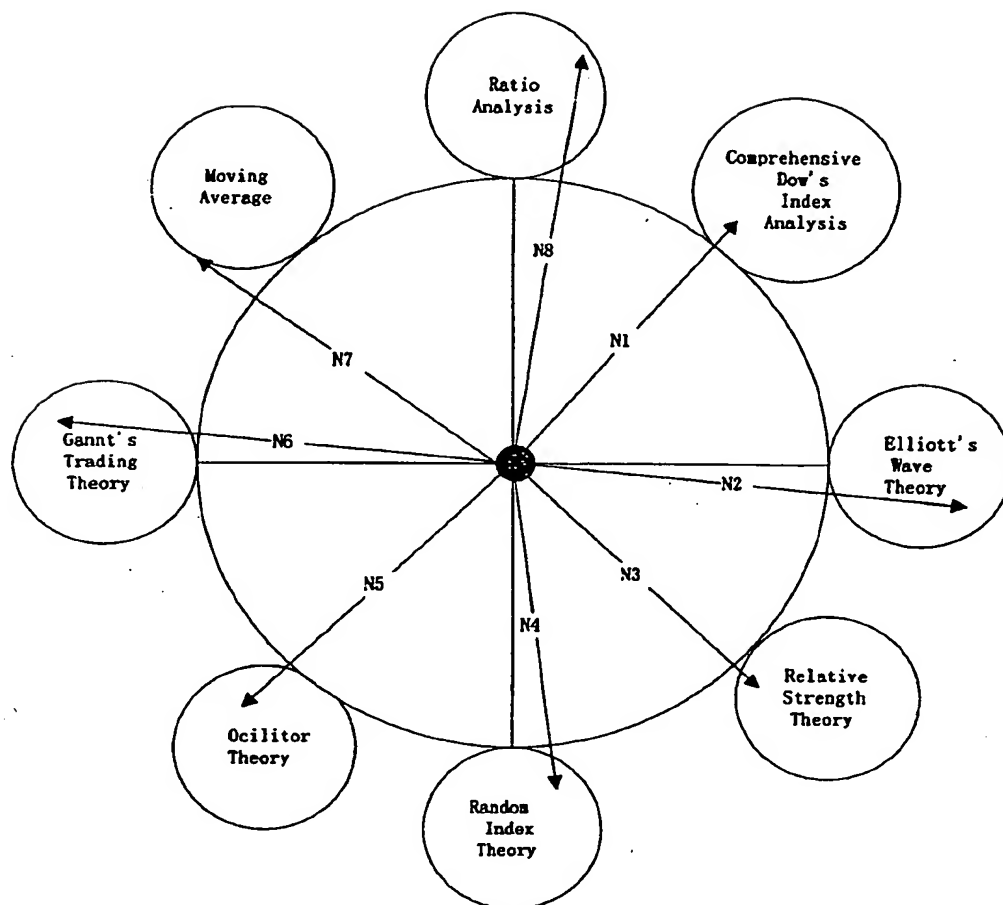


Fig. 4

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$$N = N1 + N2 + N3 + N4 + N5 + N6 + N7 + N8$$

Fig. 5

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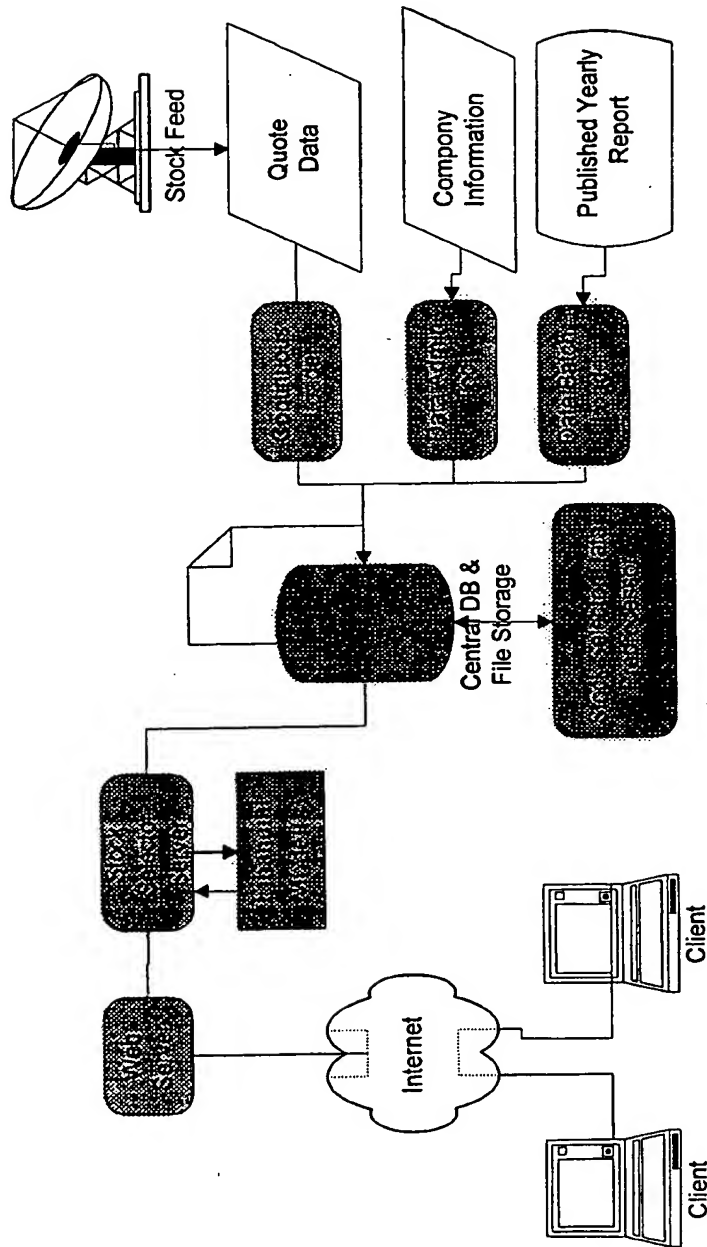


Fig. 6



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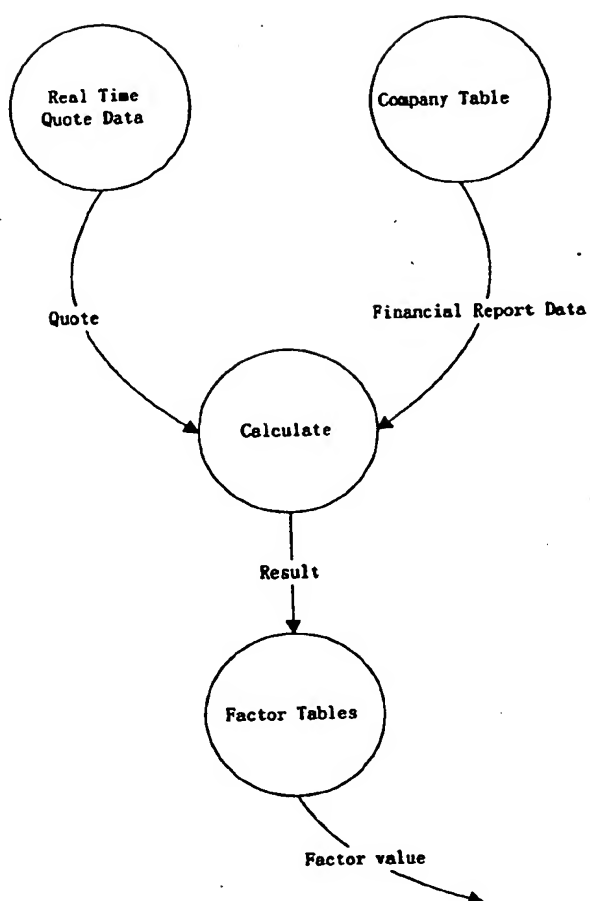


Fig. 7

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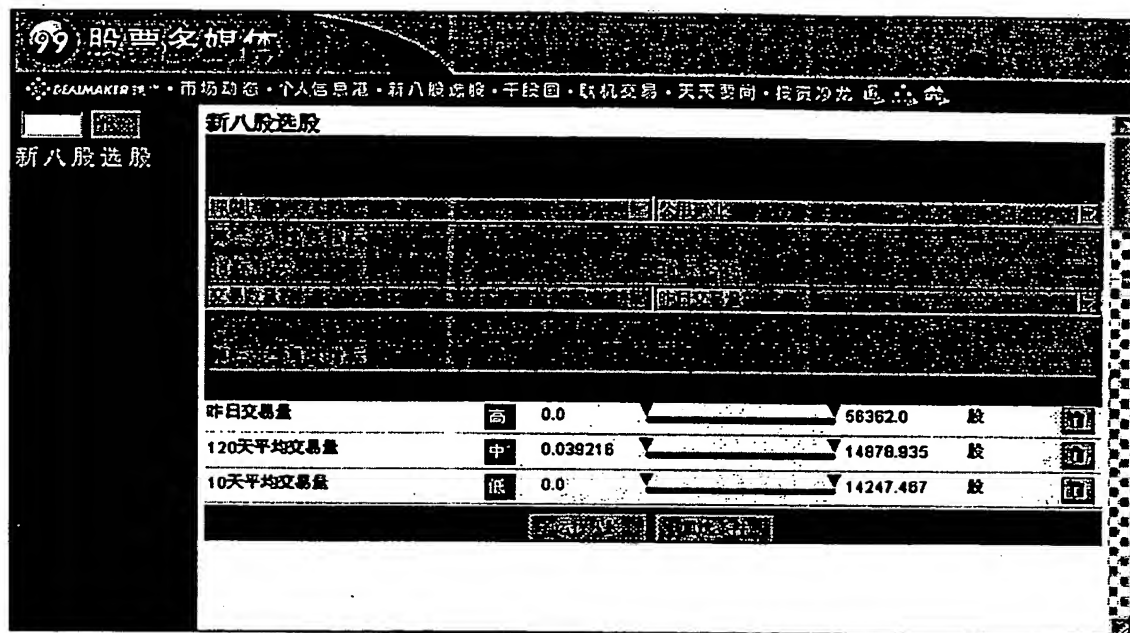


Fig. 8A

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99 Ranking Results

99 股票多媒体

1	格力电器	0776	详细
2	美的电器	0886	详细
3	海信电器	0429	详细
4	长虹电器	0793	详细
5	天鸿置业	0670	详细
6	海信电器	0426	详细
7	海信电器	0692	详细
8			详细
9			详细
10			详细

Warning: Apple Warning

Fig. 8B

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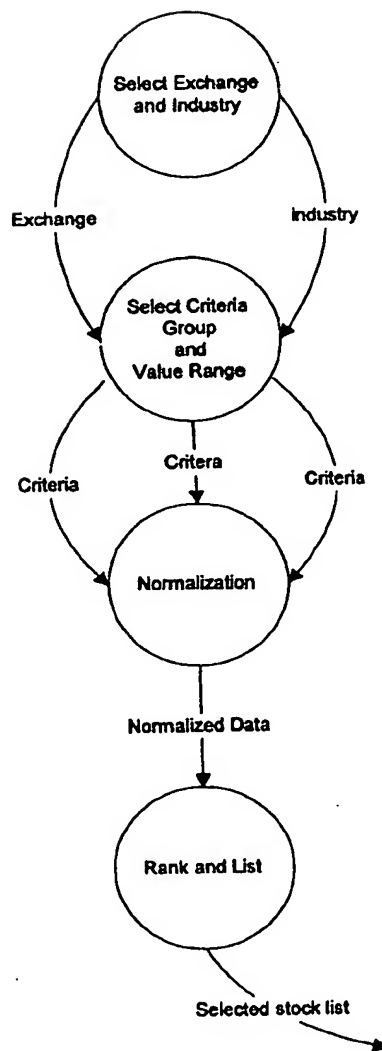


Fig. 9

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/CN 98/00283

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G06F17/30, 17/60

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06F 17/30,17/60

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, PAJ(select, search, stock, internet)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5715444, 03. 02. 1998, the whole document	1-21
A	US 5634055, 27. 05. 1997, the whole document	1-21
A	WO 97/31322, 28. 08. 1997, the whole document	1-21

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

- \* Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed
- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search  
09. Sep. 1999 (09.09.99)

Date of mailing of the international search report

23 SEP 1999 (23. 09. 99)

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玉刘  
印晓

# INTERNATIONAL SEARCH REPORT

Information patent family members

International application No.

PCT/CN 98/00283

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		JP8241336	17.09.96
		EP0792491	03.09.97
US5634055	27.05.97	NONE	
WO97/31322	28.08.97	AU2328197	10.09.97
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		AU2069697	22.09.97
		US5758328	26.05.98